

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
27 April 2006 (27.04.2006)

PCT

(10) International Publication Number  
**WO 2006/043690 A1**

(51) International Patent Classification:  
H01L 21/268 (2006.01)

(21) International Application Number:  
PCT/JP2005/019456

(22) International Filing Date: 18 October 2005 (18.10.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
2004-306140 20 October 2004 (20.10.2004) JP

(71) Applicant (for all designated States except US): SEMI-  
CONDUCTOR ENERGY LABORATORY CO., LTD.  
[JP/JP]; 398, Hase, Atsugi-shi, Kanagawa 2430036 (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): TANAKA, Koichiro  
[JP/JP]; c/o SEMICONDUCTOR ENERGY LABORA-  
TORY CO., LTD., 398, Hase, Atsugi-shi, Kanagawa  
2430036 (JP). YAMAMOTO, Yoshiaki [JP/JP]; c/o  
SEMICONDUCTOR ENERGY LABORATORY CO.,  
LTD., 398, Hase, Atsugi-shi, Kanagawa 2430036 (JP).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY,  
MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO,  
NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK,  
SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,  
VC, VN, YU, ZA, ZM, ZW.

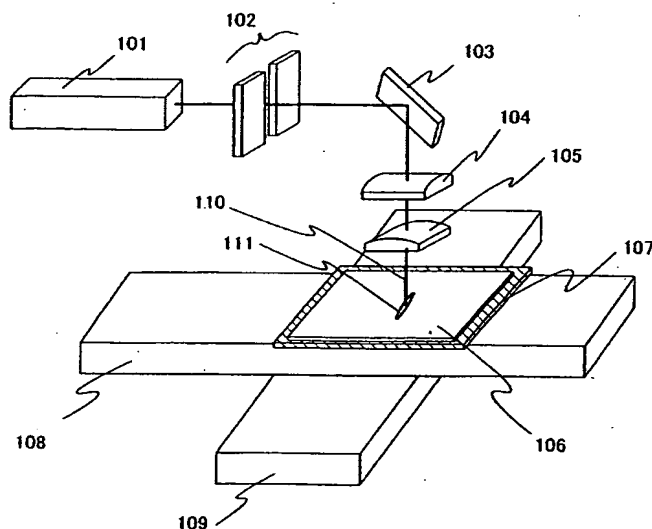
(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT,  
RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA,  
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: LASER IRRADIATION METHOD, LASER IRRADIATION APPARATUS AND METHOD FOR MANUFACTURING SEMICONDUCTOR DEVICE



(57) Abstract: In conducting laser annealing using a CW laser or a quasi-CW laser, productivity is not high as compared with an excimer laser and thus, it is necessary to further enhance productivity. According to the present invention, a fundamental wave is used without putting laser light into a non linear optical element, and laser annealing is conducted by irradiating a semiconductor thin film with pulsed laser light having a high repetition rate. A laser oscillator having a high output power can be used for laser annealing, since a non linear optical element is not used and thus light is not converted to a harmonic. Therefore, the width of a region having large grain crystals that is formed by scanning once can be increased, and thus the productivity can be enhanced dramatically.